Trend Study 15-5-99

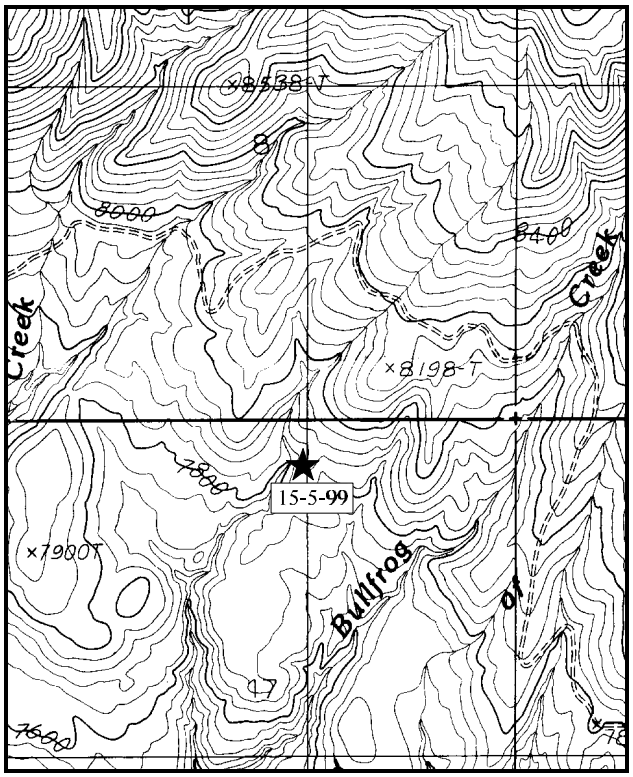
Study site name: Bates Knob . Range type: Chained, Seeded P-J .

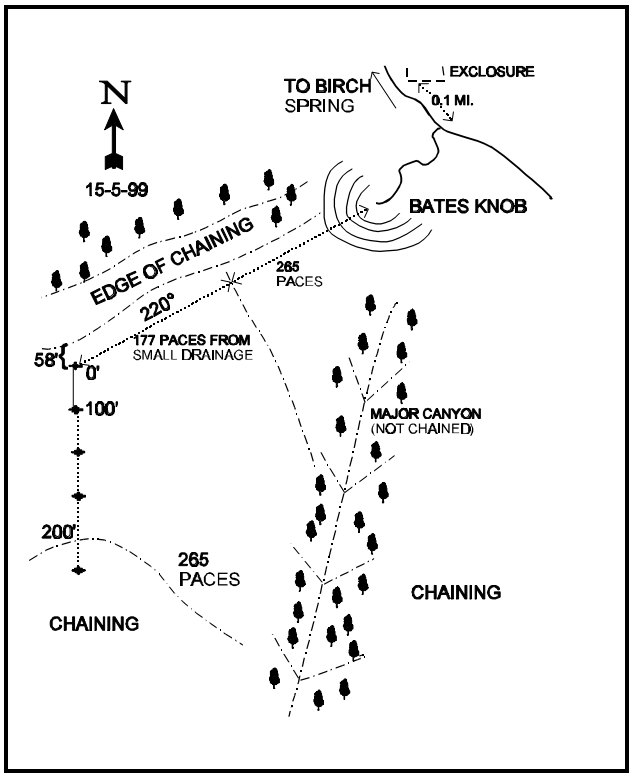
Compass bearing: frequency baseline 165°M.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Birch Spring (see transect 15-4-99), continue southwest on main road for 0.25 miles to a cattleguard. Continue another 1 mile to a cattleguard in an electric fence. From the electric fence, go 1.35 miles to a minor road which forks off to the right and goes up on top of a small hill (Bates Knob) overlooking a chaining. From the hilltop, walk down through a chained strip, over a small wash and through the chaining to the baseline stake, about 600 yards bearing 220°. The transect is marked by 1 ½-foot tall fenceposts. The first baseline stake has a red browse tag, #7421, attached.





Map Name: Mount Ellen Diagrammatic Sketch

Township 32S , Range 10E , Section 17 UTM 4208706.038 N, 514896.227 E

DISCUSSION

Trend Study No. 15-5 (38-5)

The Bates Knob study was set up to monitor range trend on a pinyon-juniper chaining located on the north end of the Pennell Allotment at an elevation of 7,700 feet. The site is on a slope that varies from 1-7% with an aspect that is generally to the southwest. Precipitation would be expected to average 12-14 inches per year. Heavy rain fell on the site the week previous to sampling in 1999. Water is available seasonally in Buck Canyon which is just south of the study site. The site is a key use area for buffalo. Seventy-five head of buffalo were observed near the site while data were being collected in July of 1987. Numerous buffalo were again observed directly on the site, as well as to the east when read in June of 1999. The study is one-fourth mile from the road and receives minimal use by people. Most of the chaining is not visible from the road, so anyone traveling on the road probably not be aware of buffalo using the chaining. Pellet group quadrat frequency for 1994 and 1999 showed a high quadrat frequency for rabbit pellet groups on this site. Pellet group data taken in 1999 show moderate to heavy use by grazing animals with 38 cow days use/acre (94 cdu/ha) being noted. Buffalo use was estimated at 26 buffalo days use/acre (64 bdu/ha). Deer use is light with nearly 3 days use/acre (7 ddu/ha) being estimated.

The soils at the site are a light colored, sandy clay loam of granitic origin. The reactivity of the soil is neutral (7.1 pH). The soil profile is rocky throughout, but not as much on the surface. The estimated effective rooting depth is 15 inches. There is an organic layer present near the surface, but it is not common to the entire site. Cattle and buffalo use is causing trails and dust bowls to form which could be a source of soil loss in the future. There is a acceptable amount of bare soil present (19% in 1999), as evidence of erosion is minimal at the present time. Downed trees left by the chaining are also piled in depressions and appear to limit erosion and to protect plants beneath them from over utilization. Organic matter is built up in some places due mostly to the chaining debris.

This site has few preferred shrubs. Rubber rabbitbrush density, estimated at 366 plants/acre in 1987, increased dramatically in 1994 to 6,100 plants/acre. In 1999, rubber rabbitbrush was split into two subspecies, green rubber rabbitbrush (*Chrysothamnus nauseosus graveolens*) a less palatable form, and white-stemmed rubber rabbitbrush (*Chrysothamnus nauseosus hololeucus*) a palatable subspecies utilized by wildlife. These two subspecies were easily separated in 1999 based on growth form and degree of hedging. Currently, the green rubber rabbitbrush population is mostly mature plants with an estimated density of 1,560 plants/acre. This subspecies has a large growth form, and shows little or no use. Recruitment for this species is slowing with 12% of the population consisting of young plants, and no seedlings being sampled in 1999. White-stemmed rubber rabbitbrush has an estimated population of 4,300 plants/acre with 73% of these being mature. This subspecies has a lower growth form and has received a lot of use. Sixty-two percent of the plants sampled in 1999 showed moderate use. Recruitment is good with 25% of the population classified as young. In 1994, biotic and reproductive potentials of rabbitbrush were very high (371%) indicating a dynamically increasing population. However, very few seedlings of either subspecies were sampled in 1999, a result of the extended drought limiting the number that actually became established. The number of young plants of both subspecies summed together is lower than the 1994 estimates. It appears that rabbitbrush at the site is becoming more stabile.

Mountain big sagebrush has continued to increase since 1987. The population was estimated at 66 plants/acre in 1987, increasing to 1,780 in 1994, and 4,740 plants/acre by 1999. The number of seedlings between 1994 and 1999 declined from 4,480 plants/acre to 220. However, recruitment is high with the number of young in the population nearly doubling from 1,180 to 2,260 plants/acre between 1994 and 1999. Decadency has remained low over all years as has the number of dead in the population. The amount of use on sagebrush is increasing as 42% of the population shows moderate use in 1999. All plants showed only light use in 1994. The age class structure of sagebrush along with few decadent or dead plants and good recruitment indicates a continued increase of this species in the future. Pinyon and juniper trees are not abundant in this area with an estimated 16 pinyon and 20 juniper trees/acre from point quarter data in 1999.

Crested wheatgrass and a rhizomatous alfalfa are the key herbaceous species for this site. These species experienced heavy utilization prior to the sampling date of July of 1987. By 1994, both alfalfa and crested wheatgrass declined significantly in their sum of nested frequency values with the continuing drought. Currently, both species are at similar levels as the 1994 reading, with sum of nested frequency slightly increasing for both. Both species were heavily utilized when the site was read in June 1999. The annual cheatgrass brome increased significantly in sum of nested frequency value between 1994 and 1999, but is still low in abundance. It currently provides 15% of the grass cover and 7% of the total vegetative cover on the site. This species appears to be expanding and is cause for concern should it continue to increase. Other forbs at the site are diverse, but most are infrequent. Many annual species are present in the understory, although most are small and insignificant at this time.

1994 TREND ASSESSMENT

Soil conditions are similar to those of 1987. Due to the gentle topography, erosion is not a problem. Browse have increased dramatically on the site since the last reading. This increase however, is at the expense of the desirable herbaceous species crested wheatgrass and alfalfa. Currently, the most numerous browse on the site is an unpalatable subspecies of rubber rabbitbrush. Trend for browse on this chaining is considered down due to the increase of undesirable shrubs. The herbaceous understory also shows a downward trend. Sum of nested frequencies of perennial grasses and perennial forbs have declined.

TREND ASSESSMENT
soil - stable
browse - down due to increase in unpalatable shrubs
herbaceous understory - down

1999 TREND ASSESSMENT

Trend for soils is stable as ground cover characteristics are similar to 1994 conditions. Vegetation and litter remain at similar levels as does bare ground. Erosion is minimal even with high traffic from livestock and buffalo. Trend for the key browse, mountain big sagebrush, is up. Density has increased since 1994 with good recruitment. Very few decadent or dead plants exist with mostly good vigor. Another palatable shrub, white-stemmed rubber rabbitbrush appears stable to slightly increasing with 1,060 young plants/acre and very few decadent plants. Vigor is good and utilization mostly moderate. The less palatable green rubber rabbitbrush has three times fewer plants in the population than white-stemmed, and appears to be stabile with few young or seedlings sampled. Overall trend for browse is slightly up. The herbaceous understory shows a stable trend, although the species composition is limited. Crested wheatgrass and alfalfa, the key species, increased slightly in sum of nested frequency. The annual cheatgrass increased significantly, but still is at low enough levels that it is not a major concern.

TREND ASSESSMENT
soil - stable
browse - up slightly
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 15 , Study no: 5

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'87	'94	'99	'87	'94	'99	'94	'99
G	Agropyron cristatum	$_{b}$300	$_{a}$253	$_{a}$269	98	90	88	10.38	11.92
G	Agropyron intermedium	3	-	-	1	-	-	-	-
G	Bouteloua gracilis	-	1	2	-	1	1	.00	.03
G	Bromus tectorum (a)	-	$_{a}$41	$_{b}$112	-	16	45	.71	2.20
G	Oryzopsis hymenoides	1	-	-	1	-	-	-	-
G	Sitanion hystrix	$_{b}$24	$_{a}$8	$_{a}$5	13	4	3	.04	.04
G	Sporobolus cryptandrus	1	1	2	1	1	1	.00	.00
Total for Annual Grasses		0	41	112	0	16	45	0.71	2.20
Total for Perennial Grasses		329	263	278	114	96	93	10.44	12.00
Total for Grasses		329	304	390	114	112	138	11.15	14.20
F	Arabis spp.	-	3	4	-	1	2	.00	.01
F	Artemisia ludoviciana	$_{b}$38	$_{a}$2	$_{a}$-	17	1	-	.03	-
F	Aster spp.	-	1	-	-	1	-	.00	-
F	Astragalus spp.	$_{a}$-	$_{b}$5	$_{ab}$2	-	3	1	.04	.00
F	Astragalus utahensis	-	4	1	-	2	1	.01	.00
F	Chenopodium album (a)	-	$_{b}$10	$_{a}$-	-	4	-	.02	-
F	Chaenactis douglasii	3	1	3	2	1	2	.00	.01
F	Cymopterus purpureus	-	2	-	-	1	-	.00	-
F	Descurainia pinnata (a)	-	$_{b}$47	$_{a}$24	-	17	9	.25	.07
F	Eriogonum alatum	$_{b}$26	$_{a}$-	$_{a}$-	11	-	-	-	-
F	Gayophytum ramosissimum (a)	-	$_{b}$18	$_{a}$1	-	7	1	.03	.00
F	Hymenoxys acaulis	$_{b}$9	$_{a}$-	$_{a}$-	3	-	-	-	-
F	Lappula occidentalis (a)	-	$_{b}$88	$_{a}$15	-	33	6	.77	.03
F	Lesquerella kingii	21	26	43	9	12	21	.09	.30
F	Machaeranthera canescens	4	8	2	3	3	2	.01	.01
F	Medicago sativa	$_{b}$109	$_{a}$30	$_{a}$49	45	16	19	2.13	1.48
F	Penstemon spp.	-	-	3	-	-	1	-	.00
F	Petradoria pumila	$_{a}$-	$_{a}$-	$_{b}$6	-	-	4	-	.09
F	Phlox longifolia	-	2	5	-	1	2	.03	.01
F	Polygonum douglasii (a)	-	$_{b}$49	$_{a}$1	-	21	1	.25	.00
F	Senecio multilobatus	-	3	-	-	2	-	.03	-
F	Sisymbrium altissimum (a)	-	21	7	-	9	4	.24	.04
F	Tragopogon dubius	1	1	-	1	1	-	.00	-
F	Unknown forb-perennial	9	-	-	4	-	-	-	-
Total for Annual Forbs		0	233	48	0	91	21	1.57	0.15
Total for Perennial Forbs		220	88	118	95	45	55	2.41	1.93
Total for Forbs		220	321	166	95	136	76	3.99	2.09

Values with different subscript letters are significantly different at % = 0.10

BROWSE TRENDS --
Herd unit 15 , Study no: 5

Type	Species	Strip Frequency '94	Strip Frequency '99	Average Cover % '94	Average Cover % '99
B	Artemisia frigida	6	5	-	.06
B	Artemisia tridentata vaseyana	20	34	1.77	3.59
B	Chrysothamnus nauseosus graveolens	73	43	5.67	4.42
B	Chrysothamnus nauseosus hololeucus	0	60	-	3.35
B	Chrysothamnus viscidiflorus	3	1	.17	-
B	Gutierrezia sarothrae	13	29	.00	.64
B	Juniperus osteosperma	0	1	-	.38
B	Pinus edulis	0	4	1.79	1.79
Total for Browse		115	177	9.42	14.25

CANOPY COVER --
Herd unit 15 , Study no: 5

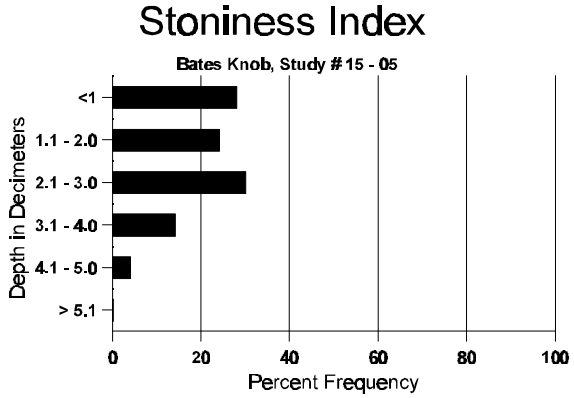
Species	Percent Cover '99
Pinus edulis	1

BASIC COVER --
Herd unit 15 , Study no: 5

Cover Type	Nested Frequency '94	Nested Frequency '99	Average Cover % '87	Average Cover % '94	Average Cover % '99
Vegetation	304	320	6.00	25.36	28.06
Rock	238	170	5.25	5.65	7.41
Pavement	181	179	5.50	.68	1.61
Litter	385	360	57.50	39.38	47.73
Cryptogams	-	6	0	0	.21
Bare Ground	268	262	25.75	18.68	19.11

SOIL ANALYSIS DATA --
Herd Unit 15, Study # 05, Study Name: Bates Knob

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.0	50.4 (15.4)	7.1	46.0	25.4	28.6	2.8	16.9	121.6	0.7



PELLET GROUP DATA --
Herd unit 15 , Study no: 5

Type	Quadrat Frequency '94	Quadrat Frequency '99	Pellet Transect Days Use/Acre (ha) '99
Rabbit	14	20	N/A
Deer	3	8	3 (7)
Buffalo	14	10	26 (64)
Cattle	-	-	38 (94)

BROWSE CHARACTERISTICS --
Herd unit 15 , Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia frigida																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	99	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	99	33	-	-	-	-	-	-	-	-	33	-	-	-	660			33
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	33	-	-	-	-	-	-	-	-	33	-	-	-	660	5	9	33
	99	9	-	-	-	-	-	-	-	-	9	-	-	-	180	2	3	9
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	+14%
'99	00%	00%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	0%
	'94	740		0%
	'99	860		2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	224	-	-	-	-	-	-	-	-	224	-	-	-	4480			224
	99	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
Y	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	94	55	-	-	2	-	-	2	-	-	59	-	-	-	1180			59
	99	91	22	-	-	-	-	-	-	-	113	-	-	-	2260			113
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	30	-	-	-	-	-	-	-	-	30	-	-	-	600	14	20	30
	99	40	72	5	2	-	-	-	-	-	119	-	-	-	2380	9	15	119
D	87	-	1	-	-	-	-	-	-	-	-	-	1	-	33			1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	5	-	-	-	-	-	-	-	5	-	-	-	100			5
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	50%	00%	50%	+96%
'94	00%	00%	00%	+62%
'99	42%	02%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	66	Dec:		50%
'94	1780			0%
'99	4740			2%

Chrysothamnus nauseosus graveolens																		
S	87	8	1	-	-	-	-	-	-	-	8	1	-	-	300			9
	94	1011	3	-	2	-	-	-	-	-	1015	1	-	-	20320			1016
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	5	1	-	-	-	-	-	-	-	5	1	-	-	200			6
	94	146	6	-	1	-	-	7	-	-	157	3	-	-	3200			160
	99	8	-	-	1	-	-	-	-	-	9	-	-	-	180			9
M	87	5	-	-	-	-	-	-	-	-	5	-	-	-	166	26	37	5
	94	83	39	1	-	-	-	-	-	-	113	1	9	-	2460	22	28	123
	99	58	4	-	-	-	-	-	-	-	62	-	-	-	1240	36	40	62
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	19	2	-	1	-	-	-	-	-	9	-	-	13	440			22
	99	7	-	-	-	-	-	-	-	-	6	-	-	1	140			7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	09%	00%	00%	+94%
'94	15%	.32%	07%	-74%
'99	05%	00%	01%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	366	Dec:		0%
'94	6100			7%
'99	1560			9%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus hololeucus																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	24	20	9	-	-	-	-	-	-	53	-	-	-	1060			53
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	16	113	27	-	-	-	-	-	-	156	-	-	-	3120	16	17	156
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	4	1	1	-	-	-	-	-	-	5	-	-	1	120			6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'94	00%	00%	00%
'99	62%	17%	.46%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	0%
	'94	0		0%
	'99	4300		3%

Chrysothamnus viscidiflorus																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	22	-	-	-	-	-	-	-	-	22	-	-	-	440			22
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	4	-	-	-	-	-	-	-	-	4	-	-	-	80	5	6	4
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	10	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'94	00%	00%	00%
'99	00%	00%	00%

%Change

-75%

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'94	80		-
	'99	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	99	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
	99	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	87	6	-	-	-	-	-	-	-	-	6	-	-	-	200	8	5	6
	94	9	2	-	-	-	-	-	-	-	11	-	-	-	220	20	31	11
	99	69	-	-	-	-	-	-	-	-	69	-	-	-	1380	7	9	69
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	10%	00%	00%	+50%
'99	00%	00%	02%	+75%

Total Plants/Acre (excluding Dead & Seedlings)				
'87	200	Dec:		0%
'94	400			0%
'99	1620			4%

Juniperus osteosperma																		
Y	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'87	33	Dec:	-
'94	0		-
'99	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Pinus edulis																		
Y	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	4	-	-	-	-	-	-	-	-	4	-	-	-	80	-	-	4
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'94	00%	00%	00%
'99	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	33	Dec:	-
	'94	0		-
	'99	80		-